

## The curse of uncertainty

**Proposed US budget cuts and the impending exit of the UK from the European Union have the potential to destabilize the global biomedical-research enterprise. In the meantime, the uncertainty of not knowing just how bad the effects will be will inflict its own damage.**

In March, US President Donald Trump presented his *America First* budget proposal to the country's Congress, and UK Prime Minister Theresa May officially notified the European Council of the nation's intention to withdraw from the EU. The deep budgetary cuts sought by Trump and the start of the Brexit process will affect the two nations in different ways. But one thing that these changes have in common is their potential to slow the pace of biomedical innovation within and beyond their borders for years to come.

The Trump administration's proposal seeks to cut the US National Institutes of Health (NIH) budget by an unprecedented 18.3% in 2018. As this issue of *Nature Medicine* went to press, it was unclear how much of this proposed reduction would come from the agency's research grants as opposed to its administrative costs. But because only around 5% of the NIH budget funds intramural administration, it is impossible for a cut of this magnitude to negatively affect only its administrative capacities. Meanwhile, although politicians have promised to protect science in the UK government budget, university labs might lose some of their biomedical-research funding, given that they currently draw a considerable portion of it from competitive, merit-based grants from the EU. It is not certain whether UK-based scientists will continue to be eligible for new funding from the EU once their country of residence exits the union.

The changes on the horizon in both the US and the UK, if fully realized, would reduce the number of training and employment opportunities in these countries for scientists who come from around the globe. For example, a 2016 report of the Royal Society indicates that 28% of academic staff at UK universities were non-UK nationals, and that nearly half of PhD students in the UK are from outside the nation. However, there is now uncertainty about whether it will be possible to continue to easily hire and train EU nationals from outside the UK, because Brexit may make it more difficult for EU nationals to move smoothly between their home country and the UK. The sharp reduction of funding in the US and the UK would also affect global researchers in a more direct way. The Trump administration's budget seeks to completely eliminate the NIH's Fogarty Center, whose core mission includes helping to train foreign scientists based in developing countries.

It is possible that after discussions between the US president and Congress, the administration's proposed cuts will be abandoned. There are also lofty hopes that negotiations between the UK prime minister and the European Commission will ensure that EU research funding

remains available to UK grant applicants. However, even if only a portion of funding is cut or made unavailable, given that global government funding of scientific research overall began flattening out in 2010, these reductions will still be felt.

Additionally, focusing on the percentage of funding in peril overlooks a different type of damage being inflicted while the world waits to find out how bad the cuts will be. This is the more insidious, less easily quantifiable damage to the morale of scientists and aspiring scientists. Consider students who are deciding whether to enroll in US biomedical PhD programs, or those who have graduated, as they debate whether to pursue academic faculty positions in the US. The events of last month will prompt them to question whether it is wise to pursue a scientific career dependent on US government funding. One could forgive many of them for deciding to put their brainpower to good use in another sector of the economy.

It is possible to draw an analogy to US law-school applications, which have been plummeting since it became apparent that employment opportunities at law firms were increasingly scarce. But in this case, the forces drawing students away from biomedicine will be more than a loss of opportunities resulting from market forces. The forces include a message sent by the proposed budget cuts that the executive branch of the US government simply does not consider biomedical research a priority.

Brexit routes young scientists in the UK into a different, yet equally frustrating, type of limbo. It is unclear whether they should invest the effort to apply for EU funding if the administrative consequences of Brexit will ultimately render such funding off-limits.

The consequences of a slow leak of bright minds out of the biomedical-research pipeline will not be felt immediately. They will manifest in a gradual sense that the flow of breakthrough ideas is not as robust as it used to be, and that an unusually long time has elapsed since we saw the last insight of the magnitude of the CRISPR-Cas tool or a breakthrough such as immunotherapy. Investors and biopharmaceutical companies will find fewer step-change ideas to fund and commercialize. There will be a vague, uncertain sense that the forward movement that we have enjoyed for so long has slowed. What is certain is that fewer dollars for scientific research today will not reduce deficits in the long run, but they will have lasting damaging effects on the global economy and human health.